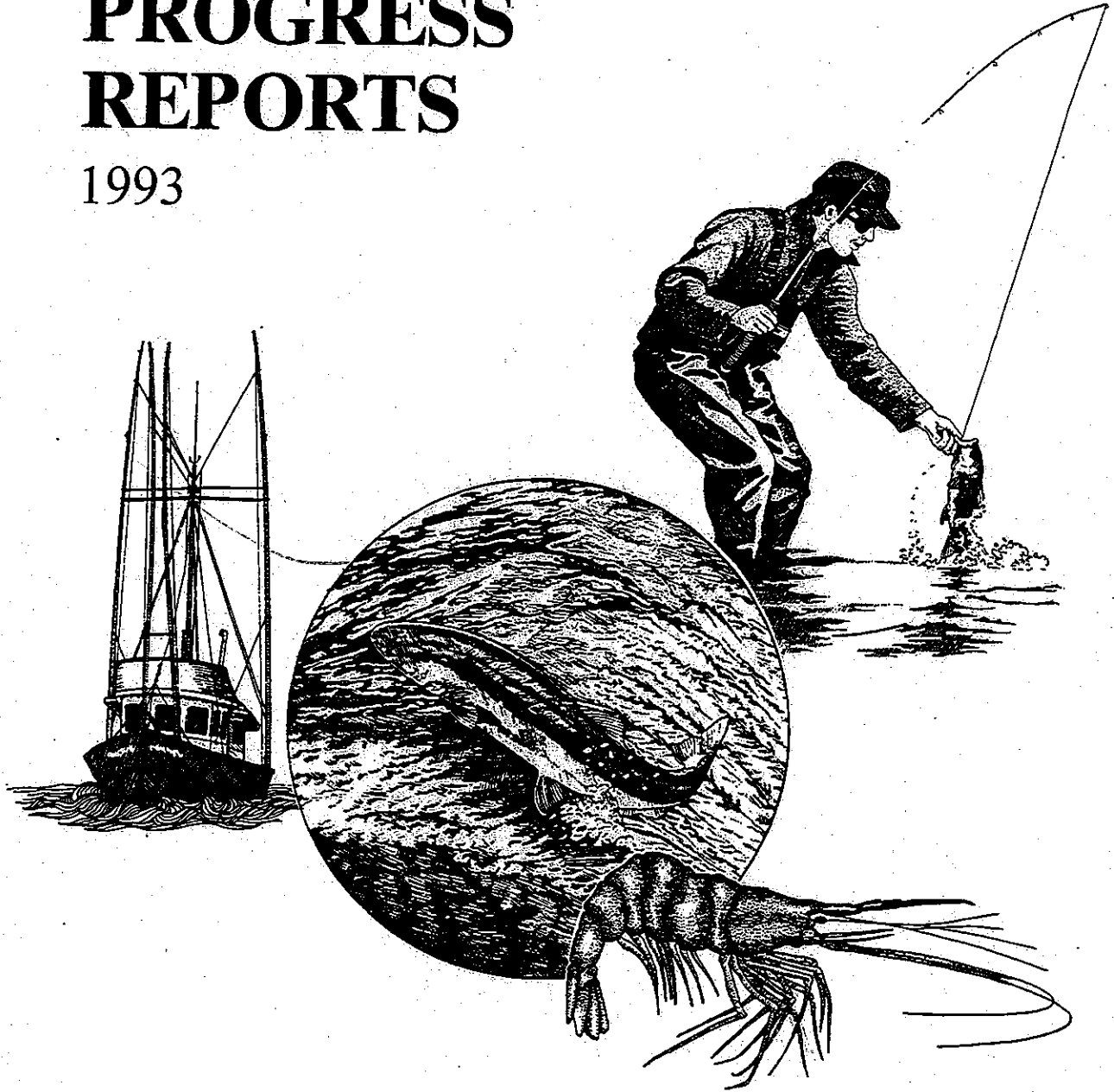


PROGRESS REPORTS

1993



FISH DIVISION

Oregon Department of Fish and Wildlife

Summer Steelhead Creel Surveys on the Grande Ronde,
Wallowa and Imnaha Rivers for the 1992-93 Run Year

ANNUAL PROGRESS REPORT

FISH RESEARCH PROJECT
OREGON

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Grande Ronde, Wallowa and Imnaha
Rivers for the 1992-93 Run year

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SUMMARY

Objectives in FY 1993

1. Estimate angler effort in hours and days for summer steelhead fisheries on the Grande Ronde, Wallowa and Imnaha rivers.
2. Estimate total catch, catch rate and number of fish harvested in summer steelhead fisheries on the Grande Ronde, Wallowa and Imnaha rivers.
3. Estimate the percent of hatchery summer steelhead in the total catch.
4. Determine length-frequency, age composition and sex composition of the fish that were caught.
5. Estimate, by tag code, the number of adipose-left ventral clipped plus coded-wire-tagged summer steelhead harvested.
6. Determine residence of anglers in summer steelhead fisheries on the Grande Ronde, Wallowa and Imnaha rivers.
7. Compare the present run year estimates to historic estimates of catch rate, harvest and angler effort in summer steelhead fisheries on the Grande Ronde, Wallowa and Imnaha rivers.

Accomplishments and Findings in FY 1993

On the lower Grande Ronde River, we estimated that 2,963 anglers fished for 15,461 hours from 1 September 1992 through 31 December 1992 and 16 February through 15 April 1993. They caught and released an estimated 573 wild and 567 hatchery steelhead and kept an estimated 544 hatchery steelhead.

On the upper Grande Ronde River, we estimated that 1,887 anglers fished for 3,030 hours from 16 February through 30 April 1993. They caught and released an estimated 22 wild and 24 hatchery steelhead and kept an estimated 177 hatchery steelhead.

On Catherine Creek, we estimated that 193 anglers fished for 485 hours from 1 March through 30 April 1993. They caught and kept an estimated 10 hatchery steelhead and no wild steelhead were caught.

On the Wallowa River, we estimated that 4,135 anglers fished for 23,458 hours from 1 February through 30 April 1993. They caught and released an estimated 305 wild and 732 hatchery steelhead and kept an estimated 1,083 hatchery steelhead.

On the Imnaha River, we estimated that 789 anglers fished for 2,910 hours from 1 March through 15 April 1993. They caught and released an estimated 130 wild and 65 hatchery steelhead and kept an estimated 171 hatchery steelhead.

The catch rates during the 1992-93 run year averaged better than 14.0 hours per fish on all fisheries, except on Catherine Creek where catch rate averaged 48.5 hours per fish.

During the 1992-93 run year, catch rates were better on the Grande Ronde, Wallowa and Imnaha rivers when compared to historic catch rate estimates. During the 1992-93 run year, total harvest was lower on the Grande Ronde and Imnaha rivers, but was higher on the Wallowa River than historic harvest estimates. During the 1992-93 run year, angler effort was higher on the Grande Ronde and Wallowa rivers, but lower on the Imnaha River than historic angler effort estimates.

Management Implications and Recommendations in FY 1993

1. To assess the success of Oregon's Lower Snake River Compensation Plan long-term objective of restoring recreational and tribal fisheries for summer steelhead, there is a need to establish specific fishery goals. As a first step towards meeting this need, we compared the 1992-93 run year estimates to historic estimates of catch rate, harvest and angler effort in steelhead fisheries on the Grande Ronde (includes surveys on the upper and lower Grande Ronde River and Catherine Creek), Wallowa and Imnaha rivers. This comparison indicated that historic values may provide useful measures in establishing goals for summer steelhead fisheries.
2. Given the need to establish specific fishery goals, a decision should be made on whether to evaluate Lower Snake River Compensation Plan objectives for northeast Oregon fisheries as a whole, or as river-specific fisheries.
3. Relative to historic fishery values, management protocols appeared to be effective at achieving a reasonable amount of angler effort in summer steelhead fisheries on both the Grande Ronde and Wallowa rivers but were not completely effective on the Imnaha River. Options to improve angler effort may include the incorporation of early returning fish into the Grande Ronde basin steelhead broodstock and the development of a native Imnaha broodstock that return earlier than the Little Sheep Creek stock currently being used for supplementation.
4. Compared to historic fishery values, management protocols appear to have been effective at achieving reasonable harvest levels in summer steelhead fisheries on the Grande Ronde and Wallowa rivers but were not completely effective on the Imnaha River. During years when the need to obtain sufficient broodstock to meet production goals is a concern, increasing angler harvest is not an option. However, during years when adult escapement is adequate for broodstock needs and especially when surplus adults are expected at collection sites, increasing the bag limit and/or extending the season length may increase the numbers of hatchery fish harvested in these fisheries.
5. Based on historic fishery values, management protocols appear to be effective at achieving reasonable catch rates in summer steelhead fisheries. Options to improve catch rates in the future, such as changing regulations to catch-and-release only, may negatively affect harvest and may affect angler effort. As with options to increase angler effort, we

need to explore ways to have more adults return to each basin. This could improve catch rates, especially if angler effort remained constant.

6. The low percent of hatchery steelhead in the catch on the lower Grande Ronde River during the fall continues to be of concern since it suggests a possible difference in the run-timing of hatchery and wild summer steelhead into the basin. We recommend considering the incorporation of early returning fish into the Grande Ronde basin steelhead broodstock which, if this characteristic is heritable, may increase the number of hatchery fish available during the fall fishery on the lower Grande Ronde River.
7. Low angler effort on the Imnaha River continues to be a concern. A potential option to increase angler effort, that warrants further investigation, is the development of native Imnaha broodstock that return earlier than the Little Sheep Creek stock currently being used. Questions that initially arise include; 1) does a native Imnaha stock exist that returns earlier compared to the Little Sheep Creek stock and 2) if so, is run-timing of adult steelhead into the Imnaha River heritable. If the answer to either question is yes, then we may be able to improve the fall and early spring fisheries in the Imnaha Basin through artificial propagation.
8. Tribal fisheries on Wallowa and Imnaha summer steelhead stocks occur primarily in the Columbia River tribal gillnet fishery (Zone 6) above Bonneville Dam. However, the presence of hatchery fish in the Grande Ronde and Imnaha river basins provide an opportunity for tribal harvest of summer steelhead. Therefore, we recommend that options be developed for tribal summer steelhead fisheries in the Grande Ronde and Imnaha basins.

INTRODUCTION

Summer steelhead (*Oncorhynchus mykiss*) fisheries in the Grande Ronde and Imnaha basins were closed in 1974. This closure was prompted by declining adult returns, as indicated by adult counts at Ice Harbor Dam on the Snake River (U.S. Army Corps of Engineers 1990) and low steelhead redd counts on index streams in the Grande Ronde and Imnaha basins (U.S. Fish and Wildlife Service, 1991). The Lower Snake River Compensation Plan (LSRCP), initiated by Congress in 1976, was developed to compensate for losses of anadromous salmonids in the Snake River basin from construction of the four lower Snake River Dams built between 1962 and 1976. One of the primary objectives of the LSRCP in Oregon is to restore historic recreational and tribal fisheries for summer steelhead in the Grande Ronde and Imnaha river basins (Carmichael 1989). Approximately 1.68 M smolts are released each year during late April and early May in the Grande Ronde and Imnaha basins. These fish provide hatchery adult returns which contribute to recreational fisheries and supplement natural spawning populations in northeast Oregon. Consumptive recreational fisheries for summer steelhead re-opened in 1986 as a result of increases in hatchery adult returns.

We began our creel surveys for summer steelhead during the fall 1985 in both the Grande Ronde and Imnaha basins. The goal of the creel surveys are to provide annual harvest information needed to assess LSRCP objectives and

compensation goals (Carmichael and Wagner 1983). This report summarizes results of creel surveys conducted during the fall of 1992 and spring of 1993 on the Grande Ronde, Wallowa and Imnaha rivers and Catherine Creek. In past years we have been unable to assess the success of restoring the recreational fisheries because no specific numerical goals have been established. Therefore, in this report we begin to address this long-term objective by examining historical estimates of catch rates, harvest and angler effort for summer steelhead fisheries in the Grande Ronde and Imnaha basins. We compared these to the present run year estimates. Results of creel surveys conducted prior to fall 1992 are reported in previous LSRCP evaluation annual reports (Carmichael et al. 1986, 1988, 1989a, 1989b and 1991; Flesher et al. 1992, 1994). The steelhead angling season surveyed in this report, during which only adipose-clipped fish could be kept, was open from 1 September 1992 to 30 April 1993 in the Grande Ronde Basin and from 1 September 1992 to 15 April 1993 in the Imnaha Basin. The steelhead season was extended in the Grande Ronde basin from 16-30 April 1993 because returning hatchery stocks of summer steelhead were perceived to be delayed by extremely cold conditions in February and March 1993, similar to conditions in spring 1989.

STUDY AREA

Creel surveys on the Grande Ronde River were conducted on a 14.6 mile section on the lower river from the Oregon-Washington state line (RM 38.7) to Wildcat Creek (RM 53.3) and an upper 24.4 mile section from Highway 82 bridge at Island City (RM 158.8) to Meadow Creek (RM 183.2). The survey on Catherine Creek was conducted on an 8.0 mile section from Davis Dam downstream of Highway 203 bridge (RM 15.0) to the Union city water supply tank (RM 21.2) above Union. The survey on the Wallowa River was conducted on a 17.8 mile section from Minam State Park (RM 8.2) to the mouth of the Lostine River (RM 26.0). Anglers who parked their vehicles at Minam State Park to fish at or just below the park were included in the survey. The survey on the Imnaha River was conducted on the lower 19.6 miles from its confluence with the Snake River (RM 0) to the mouth of Big Sheep Creek (RM 19.6) near the town of Imnaha. These areas are shown in Figure 1.

METHODS

Generally, we followed the methods described by Carmichael et al. (1989b). We sampled 50% of the weekends/holidays and 30% of the weekdays during each month of each survey for a total of 161 days. Initially, sample days were chosen randomly. They were then adjusted so that, as much as possible, weekend days (Saturday and Sunday) were represented equally and weekdays (Monday through Friday) were represented equally. Each sample day, the creel surveyor conducted a pressure count which involved driving a vehicle along the entire survey route while tallying all anglers and vehicles every three hours, beginning with a randomly selected start time. Between pressure counts, the surveyor interviewed anglers, recording the number of hours fished and the number and species caught. They also sampled all harvested fish, recording fork length, sex, weight, fin clips and collected scale samples. If the fish was coded-wire-tagged, as indicated by an adipose fin clip and left ventral (pelvic) fin clip, the surveyor cut off the snout behind the eye and placed the snout and an identification number in a plastic bag for later

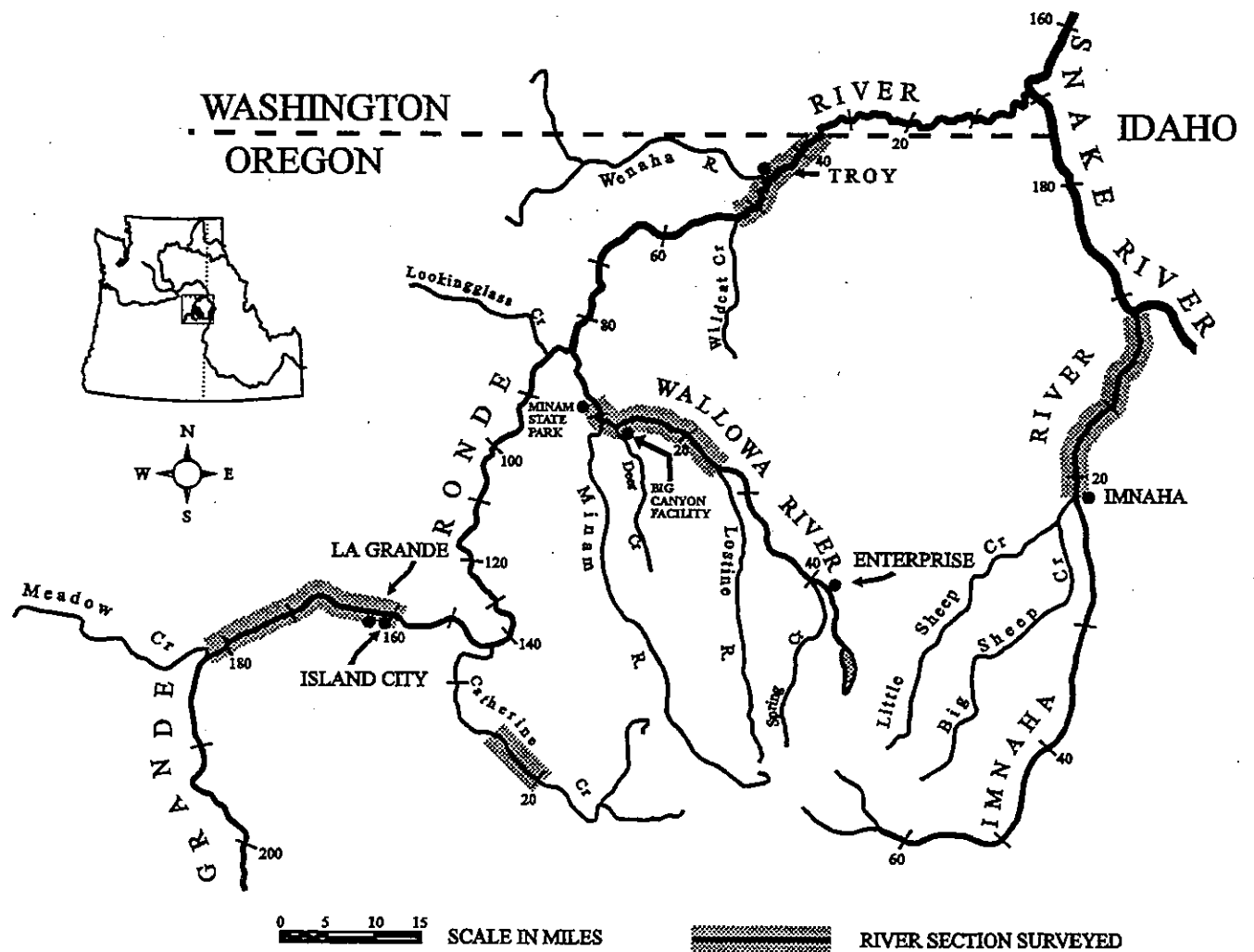


Figure 1. Map of northeastern Oregon showing where summer steelhead creel surveys were conducted in the Grande Ronde and Imnaha basins during the 1992-93 run year.

processing. From the surveys, we calculated angler effort, harvest and catch rate. Catch rate is expressed as hours per fish, which results in lower catch rates reflecting better angling success. The survey on the lower Grande Ronde River was from 1 September 1992 to 31 December 1992 and from 16 February 1993 to 15 April 1993. Even though the steelhead season was extended until 30 April 1993, we ended the lower Grande Ronde River survey early due to low angler effort. The survey on the upper Grande Ronde River was from 16 February to 30 April 1993. The survey on the Wallowa River was from 1 February to 30 April 1993. The survey on Catherine Creek was from 1 March to 30 April 1993. The survey on the Imnaha River was from 1 March to 15 April 1993.

The fishery characteristics used to document historic recreational fisheries include annual catch rates, total harvest and angler effort measured in angler hours. Historic estimates of catch rates were found in the Oregon Department of Fish and Wildlife LaGrande and Wallowa districts annual reports from 1948-74. Historic estimates of total harvest were found in Oregon Department of Fish and Wildlife, Fish Division, monthly summary tables titled "ODFW Salmon and Steelhead Catch Data" from 1956-92. We calculated historic angler effort by multiplying annual catch rates by total harvest for each year data were available. For each historic fishery characteristic, we calculated the median, mean, interquartile range and the 95% confidence interval. We then compared the historic fishery characteristics (prior to and including the 1973-74 run year) to fishery characteristics from the 1992-93 run year for the Grande Ronde (includes upper and lower Grande Ronde River and Catherine Creek surveys), Wallowa and Imnaha rivers. Surveys on the Grande Ronde River were combined because all historic harvest and most catch rate data were combined as well.

RESULTS

Lower Grande Ronde River

We estimated that 2,963 anglers fished for 15,461 hours on the lower Grande Ronde River. They caught and released 573 wild and 567 hatchery steelhead and kept 544 hatchery steelhead for a catch rate of 9.2 hours per fish (Figures 2-6, Appendix A-1). The percent of the steelhead caught that were hatchery fish ranged from 34% in September 1992 to 100% in February 1993 (Figure 7, Appendix B). Mean fork length ($\pm 95\%$ confidence interval) of harvested hatchery steelhead ranged from 580 mm (± 11) for 1-ocean females to 712 mm (± 27) for 2-ocean males (Table 1). Age composition of harvested hatchery steelhead was 51.5% 1-ocean fish and 48.5% 2-ocean fish while the sex composition was 47.8% males and 52.2% females (Table 1). On the lower Grande Ronde River, we recovered nine adipose-left ventral clipped plus coded-wire-tagged (AdLV+CWT) steelhead from our hatchery releases and one stray AdLV+CWT fish which was tagged by Washington Department of Fish and Wildlife and released in the Tucannon River (Table 2). Sixty-seven percent of the anglers were from Union or Wallowa counties, 18% were from other Oregon counties and 15% were non-residents (Table 3).

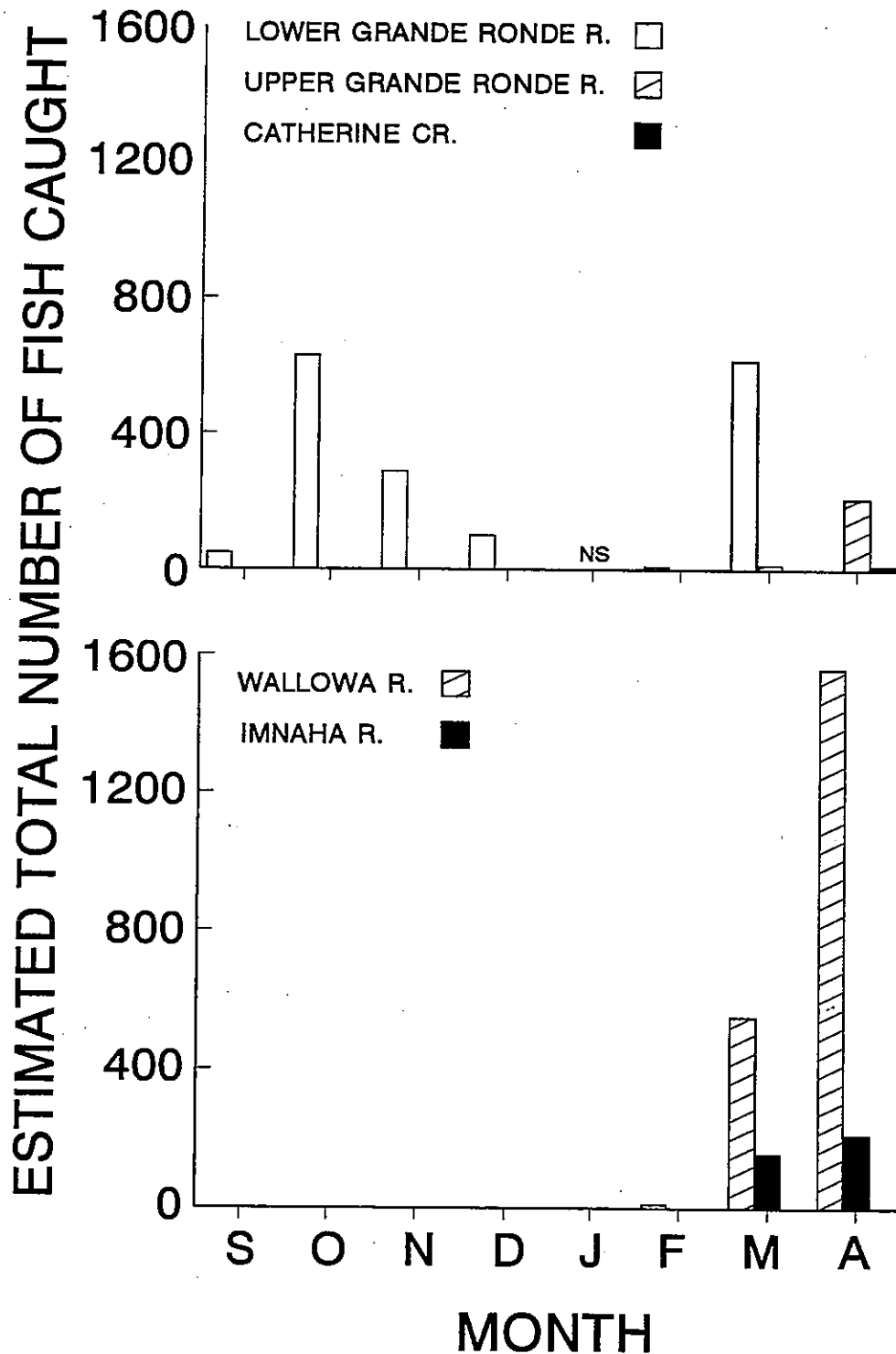


Figure 2. Estimated total catch of summer steelhead in the Grande Ronde and Imnaha basins during the 1992-93 run year. Survey areas and times include the lower Grande Ronde (1 September-15 April), upper Grande Ronde (16 February-30 April), Wallowa (1 February-30 April) and Imnaha (1 March-15 April) rivers; and Catherine Creek (1 March-30 April). NS is not sampled.

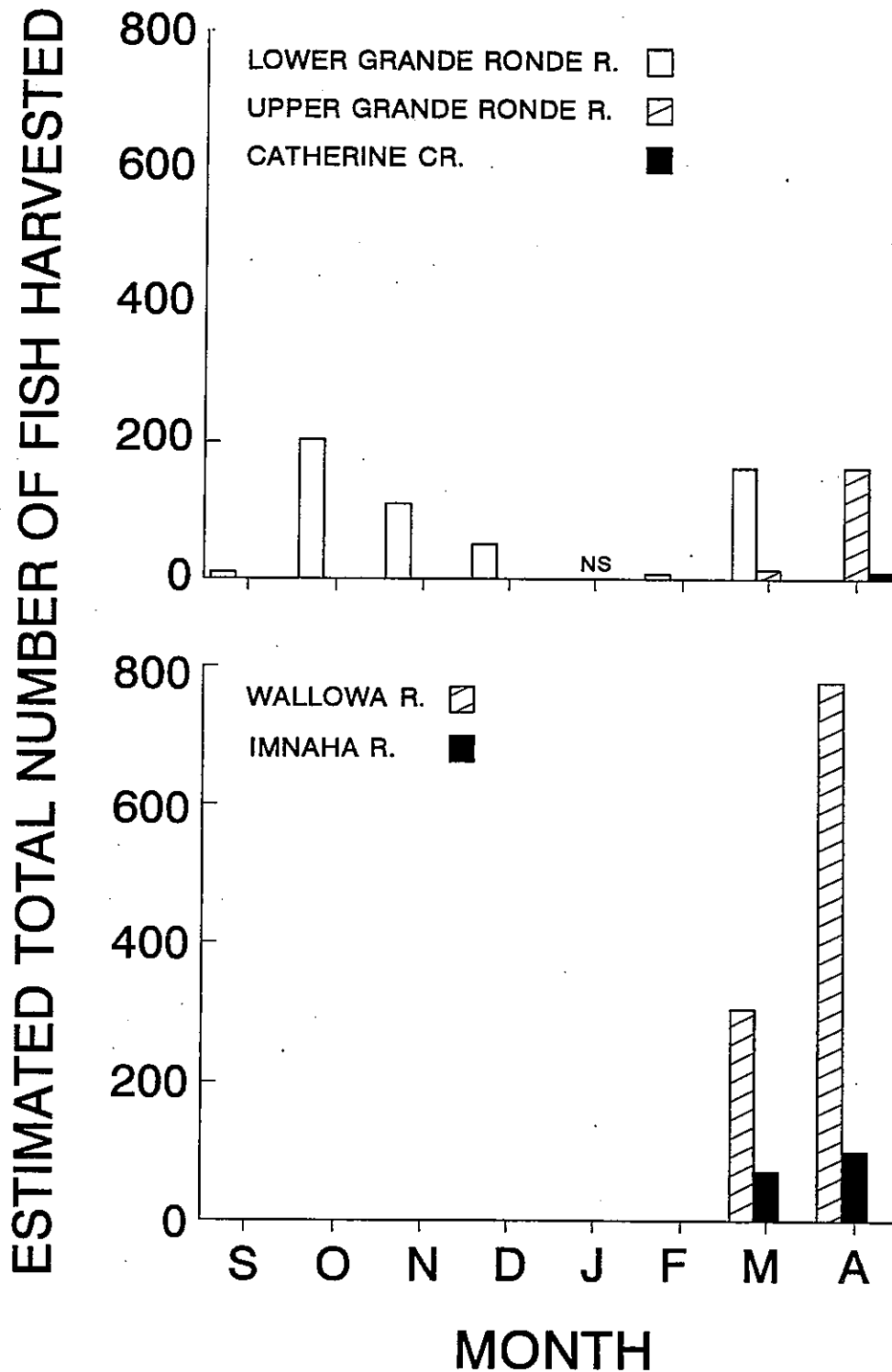


Figure 3. Estimated total harvest of summer steelhead in the Grande Ronde and Imnaha basins during the 1992-93 run year. Survey areas and times include the lower Grande Ronde (1 September-15 April), upper Grande Ronde (16 February-30 April), Wallowa (1 February-30 April) and Imnaha (1 March-15 April) rivers; and Catherine Creek (1 March-30 April). NS is not sampled.

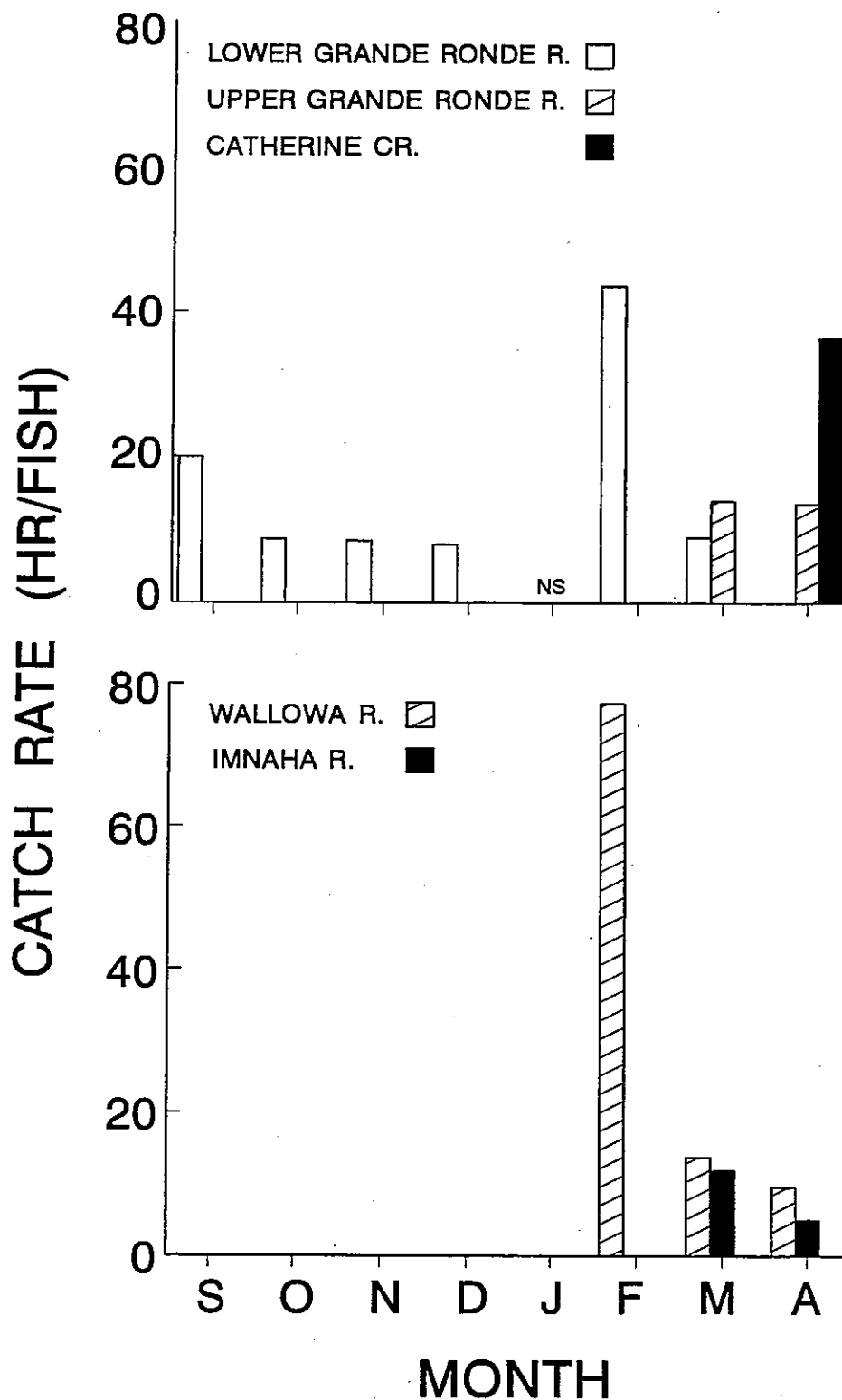


Figure 4. Estimated catch rate (fish/hr) of summer steelhead in the Grande Ronde and Imnaha basins during the 1992-93 run year. Survey areas and times include the lower Grande Ronde (1 September-15 April), upper Grande Ronde (16 February-30 April), Wallowa (1 February-30 April) and Imnaha (1 March-15 April) rivers; and Catherine Creek (1 March-30 April). NS is not sampled.

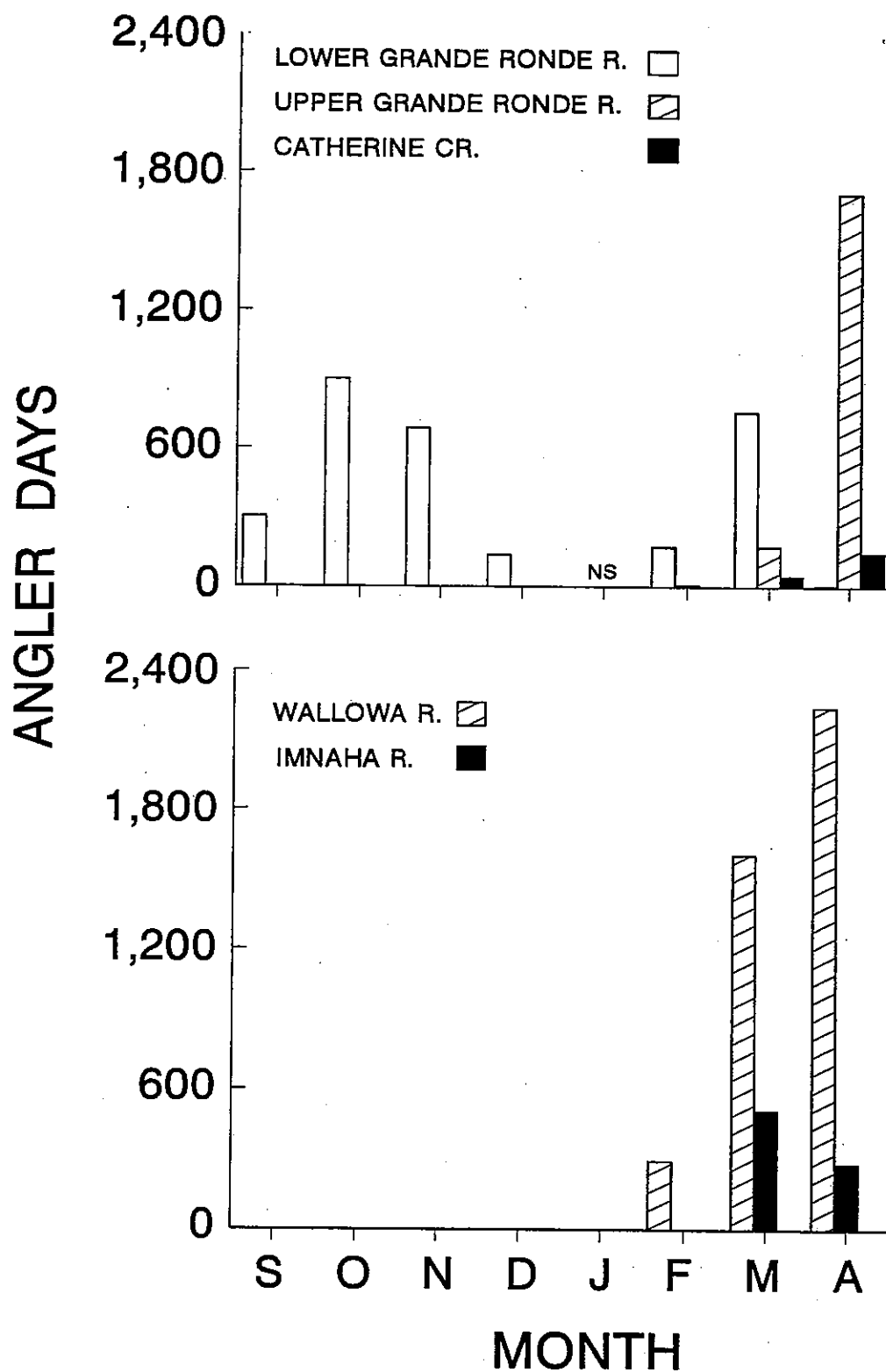


Figure 5. Estimated number of angler days for summer steelhead in the Grande Ronde and Imnaha basins during the 1992-93 run year. Survey areas and times include the lower Grande Ronde (1 September-15 April), upper Grande Ronde (16 February-30 April), Wallowa (1 February-30 April) and Imnaha (1 March-15 April) rivers; and Catherine Creek (1 March-30 April). NS is not sampled.

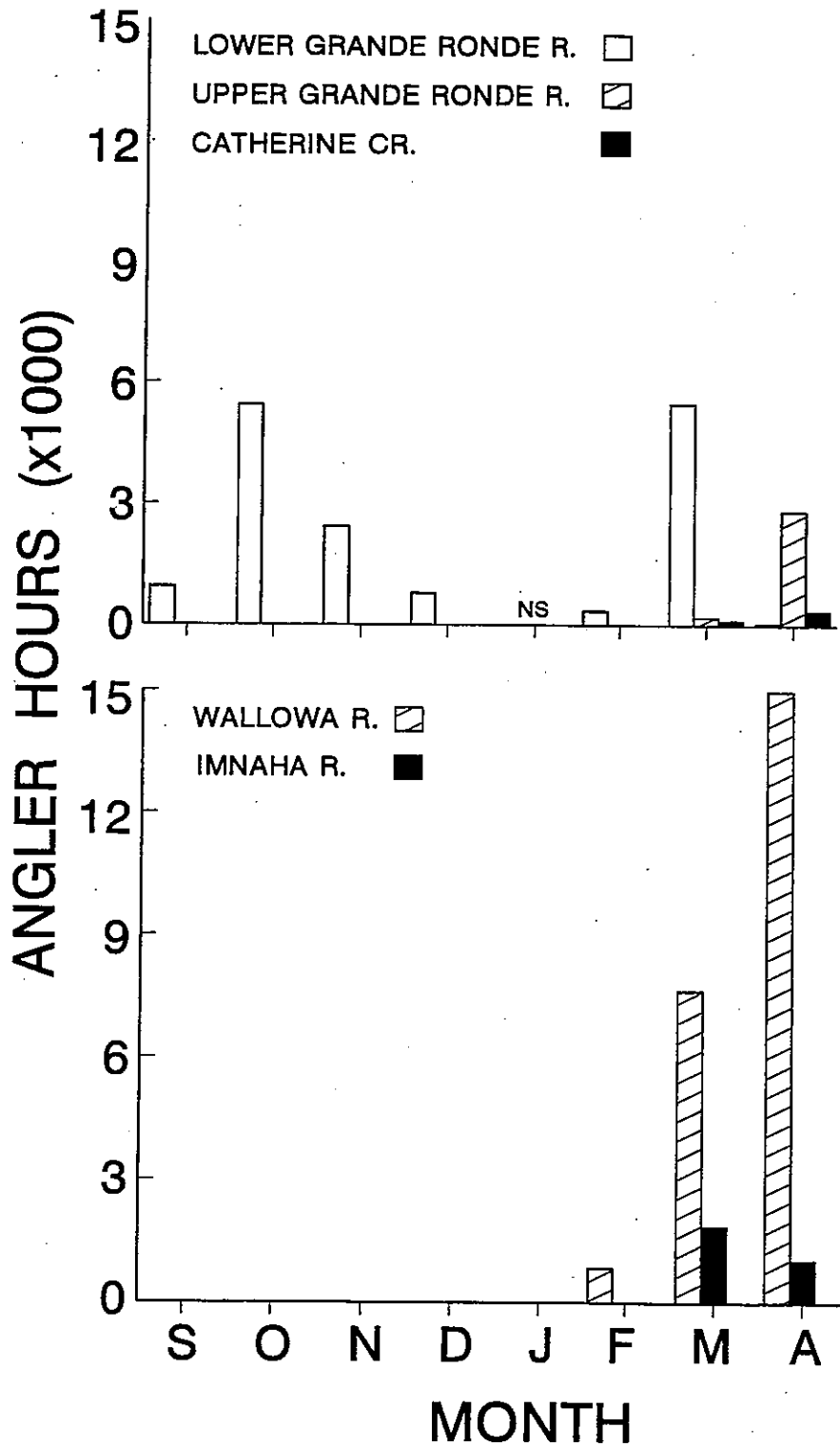


Figure 6. Estimated number of angler hours for summer steelhead in the Grande Ronde and Imnaha basins during the 1992-93 run year. Survey areas and times include the lower Grande Ronde (1 September-15 April), upper Grande Ronde (16 February-30 April), Wallowa (1 February-30 April) and Imnaha (1 March-15 April) rivers; and Catherine Creek (1 March-30 April). NS is not sampled.

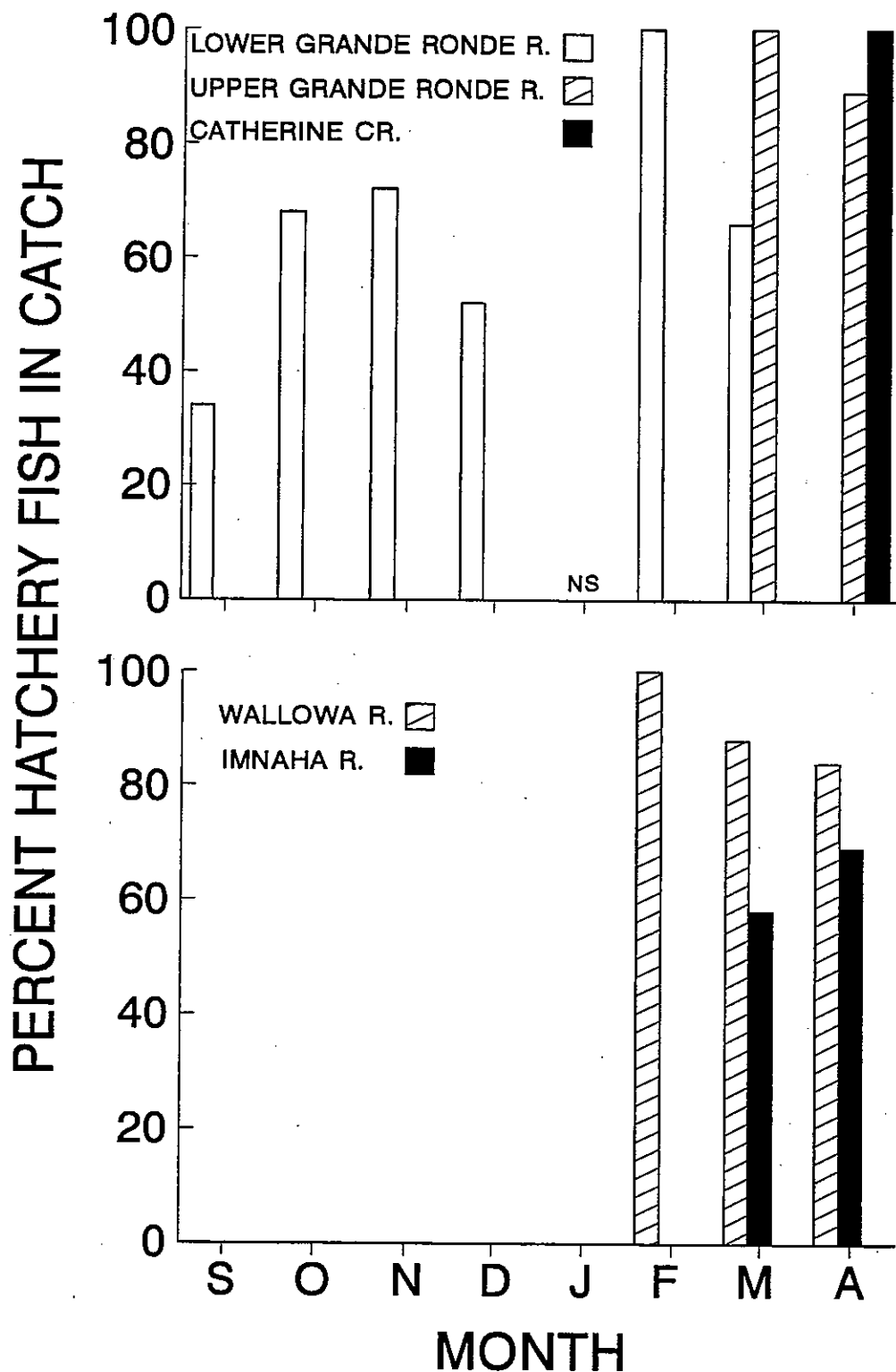


Figure 7. Estimated percent of the summer steelhead caught in the Grande Ronde and Imnaha basins during the 1992-93 run year that were hatchery fish. Survey areas and times include the lower Grande Ronde (1 September-15 April), upper Grande Ronde (16 February-30 April), Wallowa (1 February-30 April) and Imnaha (1 March-15 April) rivers; and Catherine Creek (1 March-30 April). NS is not sampled.

Table 1. Percent age composition and mean fork length of summer steelhead sampled in creel surveys in the Grande Ronde and Imnaha basins during the 1992-93 run year. Mean fork length includes $\pm 95\%$ confidence interval. Age is expressed as years spent in freshwater prior to ocean migration: years spent in the ocean prior to spawning migration.

Creel survey area, sex	Age composition (%)			Mean Fork length (mm)			
	N	1:1	1:2	N	1:1	N	1:2
Lower Grande Ronde							
Male	65	77	23	48	584 \pm 6	15	712 \pm 27
Female	71	28	72	20	580 \pm 11	50	695 \pm 10
Upper Grande Ronde							
Male	2	50	50	1	585	1	645
Female	15	20	80	3	573 \pm 66	12	686 \pm 25
Catherine Creek							
Male	2	50	50	1	585	1	775
Female	2	100	0	2	575 \pm 0	--	--
Wallowa							
Male	59	78	22	46	585 \pm 10	13	730 \pm 32
Female	67	31	69	21	572 \pm 13	46	687 \pm 11
Imnaha							
Male	27	74	26	20	593 \pm 9	7	709 \pm 35
Female	41	61	39	25	571 \pm 10	16	698 \pm 18

Table 2. Observed and expanded number of AdLV+CWT summer steelhead recoveries in the Grande Ronde and Imnaha basins during the 1992-93 run year. No AdLV+CWT fish were recovered in Catherine Creek or in the upper Grande Ronde River. Tag recoveries were expanded for the entire fishery.

Creel survey area	Tag code	Experimental Group	Brood Year	Number recovered		% of release
				Observed	Expanded	
Lower Grande Ronde	07 51 19	Direct Stream	89	2	11	.04
	07 51 20	4/1b	89	1	8	.03
	07 51 21	4/1b	89	2	7	.03
	07 51 23	Acclimated, 5/1b	89	2	9	.03
	07 53 51	Acclimated	90	2	8	.03
	07 53 52	Acclimated	90	1	5	.02
	07 53 59	4/1b	90	1	3	.01
	07 53 60	4/1b	90	2	10	.04
	07 54 43	5/1b	90	1	3	.01
	63 14 47	WDFW ^a	90	1	2	--
Upper Wallowa	07 51 22	Acclimated, 5/1b	89	2	14	.05
	07 53 51	Acclimated	90	3	21	.08
	07 53 52	Acclimated	90	1	8	.03
	07 53 53	Direct Stream	90	3	22	.08
	07 53 54	Direct Stream	90	3	17	.07
	07 53 59	4/1b	90	1	7	.03
	07 53 60	4/1b	90	2	16	.06
	07 54 43	5/1b	90	1	7	.02
	07 54 44	5/1b	90	1	8	.03
Imnaha	07 51 24	Production	89	3	8	.03
	07 53 56	Direct Stream	90	2	5	.03
	07 53 57	Acclimated	90	2	5	.02
	07 53 58	Acclimated	90	2	11	.04

^aThe fish with tagcode 63-14-47 was a stray steelhead from a smolt release by Washington Department of Fish and Wildlife (WDFW) in the Tucannon River.

Table 3. Residence of summer steelhead anglers interviewed during creel surveys in the Grande Ronde and Imnaha basins during the 1992-93 run year.

Creel survey area	Number of anglers	Percent from		
		Wallowa and Union counties	Other Oregon counties	Out-of-state
Lower Grande Ronde	754	67	18	15
Upper Grande Ronde	266	97	2	1
Catherine Creek	58	100	0	0
Upper Wallowa	912	63	33	4
Imnaha	319	89	6	5

Upper Grande Ronde River

On the upper Grande Ronde River, we estimated that 1,887 anglers fished for 3,030 hours. They caught and released 22 wild and 24 hatchery steelhead and kept 177 hatchery steelhead for a catch rate of 13.6 hours per fish (Figures 2-6, Appendix A-2). The percent of the steelhead caught that were hatchery fish ranged from 89% in April to 100% in March (Figure 7, Appendix B). Mean fork length ($\pm 95\%$ confidence interval) of harvested hatchery steelhead ranged from 573 mm (± 66) for 1-ocean females to 686 mm (± 25) for 2-ocean females (Table 1). Age composition of harvested hatchery steelhead was 23.5% 1-ocean fish and 76.5% 2-ocean fish while the sex composition was 11.8% males and 88.2% females (Table 1). No AdLV+CWT steelhead have been released or were recovered on the upper Grande Ronde River (Table 2). Ninety-seven percent of the anglers were from Union or Wallowa counties, 2% were from other Oregon counties and 1% were non-residents (Table 3).

Catherine Creek

On Catherine Creek, we estimated that 193 anglers fished for 485 hours. They caught and kept 10 hatchery steelhead for a catch rate of 48.5 hours per fish (Figures 2-6, Appendix A-3). All steelhead caught in Catherine Creek

were hatchery fish (Figure 7, Appendix B). Mean fork length ($\pm 95\%$ confidence interval) of harvested hatchery steelhead ranged from 575 mm (± 0) for 1-ocean female to 775 mm for a 2-ocean male (Table 1). Age composition of harvested hatchery steelhead was 75.0% 1-ocean fish and 25.0% 2-ocean fish while the sex composition was 50.0% males and 50.0% females (Table 1). No AdLV+CWT steelhead have been released or were recovered in Catherine Creek (Table 2). All of the anglers were from Union or Wallowa counties (Table 3).

Wallowa River

On the Wallowa River, we estimated that 4,135 anglers fished for 23,458 hours. They caught and released 305 wild and 732 hatchery steelhead and kept 1,083 hatchery steelhead for a catch rate of 11.1 hours per fish (Figures 2-6,

Appendix A-5). The percent of the steelhead caught that were hatchery fish ranged from 84% in April to 100% in February (Figure 7, Appendix B). Mean fork length ($\pm 95\%$ confidence interval) of harvested hatchery steelhead ranged from 572 mm (± 13) for 1-ocean females to 730 mm (± 32) for 2-ocean males (Table 1). Age composition of harvested hatchery steelhead was 53.2% 1-ocean fish and 46.8% 2-ocean fish while the sex composition was 46.8% males and 53.2% females (Table 1). On the Wallowa River, we recovered nine AdLV+CWT steelhead from our hatchery releases (Table 2). Sixty-three percent of the anglers were from Union or Wallowa counties, 33% were from other Oregon counties and 4% were non-residents (Table 3).

Imnaha River

On the Imnaha River, we estimated that 789 anglers fished for 2,910 hours. They caught and released 130 wild and 65 hatchery steelhead and kept 171 hatchery steelhead for a catch rate of 8.0 hours per fish (Figures 2-6, Appendix A-6). The percent of the steelhead caught that were hatchery fish ranged from 58% in March to 69% in April (Figure 7, Appendix B). Mean fork length ($\pm 95\%$ confidence interval) of harvested hatchery steelhead ranged from 571 mm (± 10) for 1-ocean females to 709 mm (± 35) for 2-ocean males (Table 1). Age composition of harvested hatchery steelhead was 66.2% 1-ocean fish and 33.8% 2-ocean fish while the sex composition was 39.7% males and 60.3% females (Table 1). On the Imnaha River, we recovered four AdLV+CWT steelhead from our hatchery releases (Table 2). Eighty-nine percent of the anglers were from Union or Wallowa counties, 6% were from other Oregon counties and 5% were non-residents (Table 3).

Historic Fisheries

Grande Ronde River

On the Grande Ronde River, the historic median catch rate, harvest and angler effort was 14.2 hours per fish, 764 fish and 11,408 angler hours, respectively (Table 4). The historic mean catch rate, harvest and angler effort was 10.8 hours per fish, 847 fish and 12,479 angler hours, respectively. The historic interquartile range for catch rate, harvest and angler effort was 11.2 to 16.0 hours per fish, 535 to 1,174 fish and 9,483 to 15,594 angler hours, respectively. The historic 95% confidence interval for catch rate, harvest and angler effort was 8.8 to 14.1 hours per fish, 584 to 1,110 fish and 8,426 to 16,352 angler hours, respectively.

Wallowa River

On the Wallowa River, the historic median catch rate, harvest and angler effort was 35.2 hours per fish, 122 fish and 3,016 angler hours, respectively. The historic mean catch rate, harvest and angler effort was 27.8 hours per fish, 136 fish and 3,898 angler hours, respectively. The historic interquartile range for catch rate, harvest and angler effort was 14.2 to 114.0 hours per fish, 70 to 204 fish and 2,275 to 4,984 angler hours, respectively. The historic 95% confidence interval for catch rate, harvest and angler effort was 18.3 to 57.1 hours per fish, 89 to 183 fish and 1,547 to 6,249 angler hours, respectively.

Table 4. Historic measures for summer steelhead recreational fisheries for the Grande Ronde, Wallowa and Imnaha rivers.

River, variable	Catch rate	Harvest	Angler hours
Grande Ronde			
median	14.2	764	11,408
mean	10.8	847	12,479
interquartile range	11.2-16.0	535-1,174	9,483-15,594
95% confidence interval	8.8-14.1	584-1,110	8,426-16,352
Wallowa			
median	35.2	122	3,016
mean	27.8	136	3,898
interquartile range	14.2-114.0	70-204	2,275-4,984
95% confidence interval	18.3-57.1	89-183	1,547-6,249
Imnaha			
median	15.1	627	10,605
mean	12.6	676	18,029
interquartile range	12.4-20.9	507-860	8,895-13,860
95% confidence interval	8.8-22.1	530-822	2,270-33,788

Imnaha River

On the Imnaha River, the historic median catch rate, harvest and angler effort was 15.1 hours per fish, 627 fish and 10,605 angler hours, respectively. The historic mean catch rate, harvest and angler effort was 12.6 hours per fish, 676 fish and 18,029 angler hours, respectively. The historic interquartile range for catch rate, harvest and angler effort was 12.4 to 20.9 hours per fish, 507 to 860 fish and 8,895 to 13,860 angler hours, respectively. The historic 95% confidence interval for catch rate, harvest and angler effort was 8.8 to 22.1 hours per fish, 530 to 822 fish and 2,270 to 33,788 angler hours, respectively.

DISCUSSION

Current Fisheries

We estimated that angler effort during the 1992-93 run year was the third highest it has been since the fishery re-opened in 1986. In both the Grande Ronde and Imnaha basins, estimated angler effort was the third highest in the last eight years when surveys began in 1986 (Figure 8). Estimated total catch of summer steelhead in each basin was the second highest since surveys began, as was the estimated total harvest (Figure 9). Catch rates ranging from 8.0 hours per fish on the Imnaha River to 13.6 hours per fish on the upper Grande Ronde River, were nearly as high as the best catch rates estimated from our creel surveys. No substantial fishery at Rondowa occurred due to snow blocking the primary access road, therefore no survey was

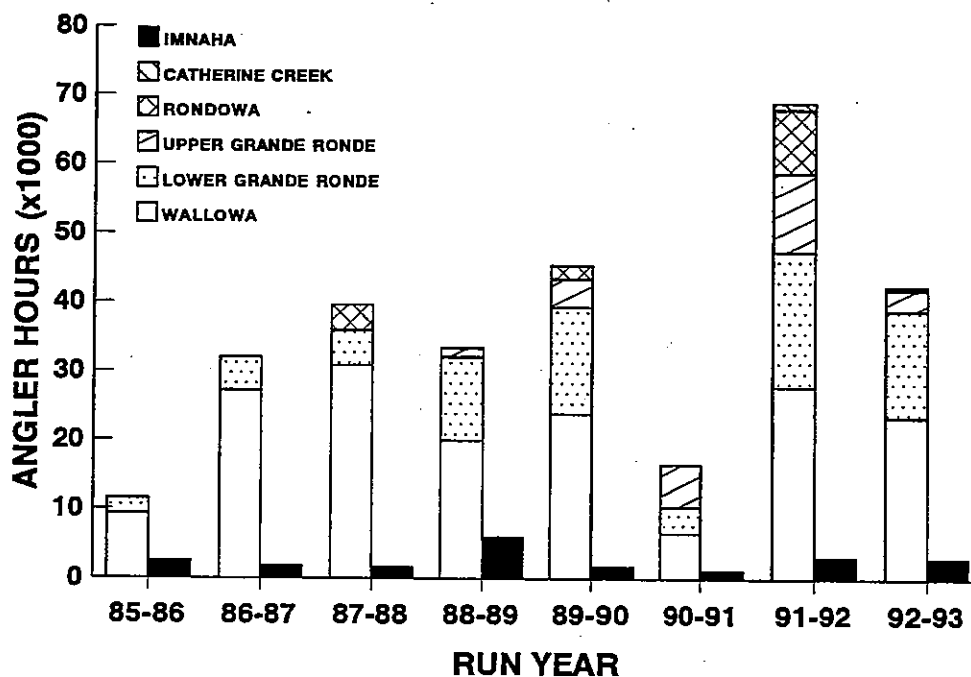


Figure 8. Angler effort for summer steelhead in the Grande Ronde and Imnaha basins from 1986-93.

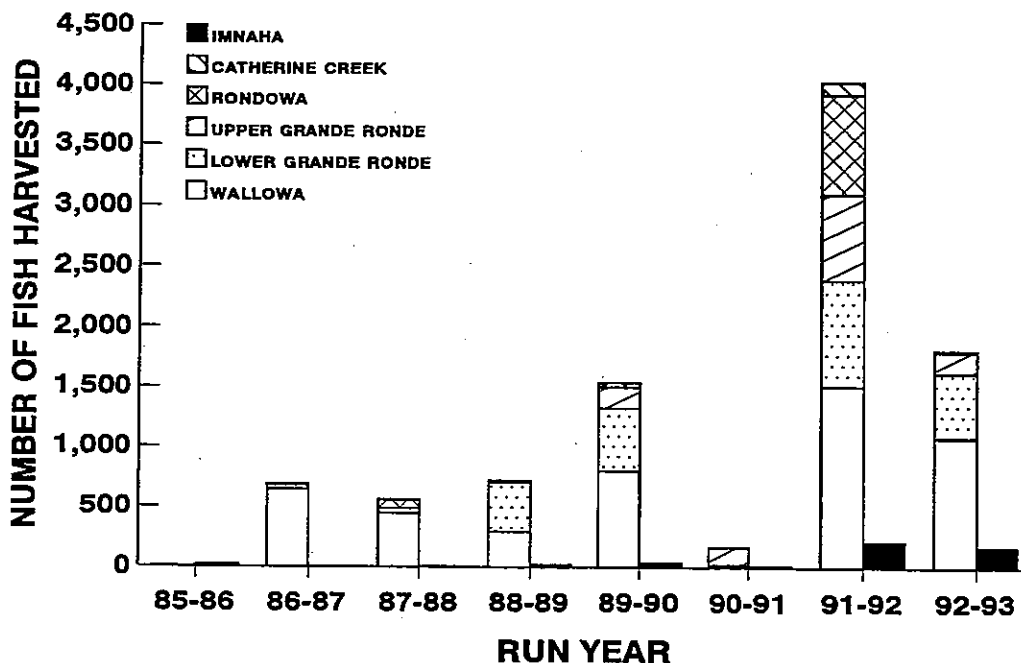


Figure 9. Number of hatchery summer steelhead harvested by recreational anglers in the Grande Ronde and Imnaha basins from 1986-93.

conducted. Both the Grande Ronde and Imnaha rivers had higher than average (1986-92) flows during March and April of 1993, which may have contributed to lower overall angler effort when compared to the 1991-92 run year. However, during the 1992-93 season, a record amount of angler effort occurred during the fall fishery from September to December 1992 and in March 1993 on the lower Grande Ronde River.

Adult compensation goals under the Lower Snake River Compensation Plan program of 9,184 and 2,000 adults for the Grande Ronde and Imnaha basins, respectively, have generally not been met. This is despite the fact that production goals of 1.35 M and 330 K smolts have generally been achieved beginning with the 1986 brood for the Grande Ronde Basin and the 1987 brood for the Imnaha Basin, respectively (Messmer et al. 1992). Each adult compensation goal includes fish for broodstock, natural escapement and fisheries. When adult compensation goals begin to be consistently met in the future, significant improvements in angler effort, harvest and catch rate may occur, especially on the Imnaha River.

Two concerns have been identified for specific fisheries (Carmichael et al. 1988, 1989a, 1989b, 1990 and 1991; Flesher et al. 1992, 1994) that may affect Oregon's LSRCP long-term goal of restoring recreational and tribal summer steelhead fisheries in the Grande Ronde and Imnaha basins. One concern is the later run-timing of hatchery-reared Wallowa stock steelhead when compared to the naturally produced fish entering the Grande Ronde basin (Carmichael et al. 1990). Initially, our broodstock for the Grande Ronde basin was taken directly from the Snake River during the spring (Carmichael 1990). Presently, our broodstock reflects the entire spawn-timing distribution of adults that return to Wallowa Hatchery. However, it is unclear whether spawn-timing in the hatchery is related to run-timing into the Grande Ronde basin. This relationship warrants further investigation since an earlier returning stock to the Grande Ronde basin may increase the number of hatchery fish available during the fall fishery on the lower Grande Ronde River.

A second concern is the low exploitation on the Imnaha River despite record catch rates in recent years. Since the fishery was re-opened in 1986, low angler effort has persisted each year and it may be due in part to anglers choosing to fish in the highly successful fishery on the Wallowa River in the Grande Ronde basin. Also, more smolts are released in the Grande Ronde basin (1.35 M annually) than in the Imnaha basin (330 K annually), so we have correspondingly higher adult escapement each year. Finally, the Wallowa River is not as remote and therefore many anglers may choose to fish the Wallowa rather than the Imnaha River. The critical question is whether or not the Imnaha River fishery can and should be restored to historic levels, given current management protocols. An option to increase angler effort in the Imnaha Basin may involve increasing the fall component of the run into the Imnaha River. Historically, an average ($n=16$) of $49\pm11\%$ of the harvest (based on punch cards) in the Imnaha River occurred during the fall months. From the 1987-88 through the 1991-92 run year, an average ($n=5$) of only $24\pm21\%$ of the harvest occurred during the fall months. This suggests that the timing of the Imnaha fishery may have changed from a fall and spring fishery to predominantly a spring fishery. Whether or not a shift in the timing of the fishery is related to a shift in the run-timing of the population warrants further investigation. This is especially true if, compared to the Little

Sheep Creek stock which is the stock currently being propagated, an earlier returning native Imnaha stock exists. Furthermore, if run-timing of adults into the Imnaha River is heritable, which has been suggested for other stocks (Rosentreter 1977, Smoker 1985 and Leider et al. 1986), it may be possible to modify the fishery through artificial propagation.

Historical Fisheries

For the Grande Ronde River, it is unclear whether 1992-93 summer steelhead fisheries reached historic levels. During the 1992-93 run year, catch rate was better than the historic median catch rate (Figure 10) and angler effort was higher than the historic median angler effort (Figure 11). However, harvest was lower than the historic median harvest (Figure 12). Similarly, catch rate was better than the historic mean catch rate and angler effort was higher than the historic mean angler effort. However, harvest was lower than the historic mean harvest. This would lead one to conclude that all aspects of the 1992-93 Grande Ronde River fishery did not reach historic levels. In contrast, catch rate was outside and better than the interquartile range and within the 95% confidence interval of historic catch rates. Harvest was within the interquartile range and the 95% confidence interval of historic harvest. Angler effort was outside and higher than the interquartile range and the 95% confidence interval of historic angler effort. This data suggests that the 1992-93 Grande Ronde River fishery did reach historic levels. This analysis suggests that, with the exception of harvest, the 1992-93 fishery compared favorably with historic fisheries in the Grande Ronde River. Furthermore, the data illustrate the potential importance of the measure used to describe historic fisheries.

For the Wallowa River during the 1992-93 run year, summer steelhead fisheries exceeded all measures of the historic fishery. Catch rate was better than the historic median (Figure 10) and mean catch rate. Angler effort was higher than the historic median (Figure 11) and mean angler effort. Harvest was higher than the historic median (Figure 12) and mean harvest. Similarly, catch rate was outside and better than the interquartile range and 95% confidence interval of historic catch rates. Angler effort was outside and higher than the interquartile range and 95% confidence interval of historic angler effort. Harvest was outside and above the interquartile range and 95% confidence interval of historic harvest. These data indicate that the 1992-93 fishery in the Wallowa River was substantially different than the historic fishery. When the 1992-93 fishery was compared to the historic median, for example, catch rate was improved more than 3-fold, effort was more than 7-fold higher, and harvest was increased more than 8-fold. Thus, current management strategies resulted in the fishery restoration objective of the Lower Snake River Compensation Plan being achieved in the 1992-93 Wallowa River fishery. Furthermore, these changes may have altered the dynamics of steelhead fisheries in Northeast Oregon.

For the Imnaha River during the 1992-93 run year, summer steelhead fisheries did not reach historic levels. Catch rate was better than the historic median (Figure 10) and mean catch rate. However, angler effort was lower than the historic median (Figure 11) and mean angler effort, and harvest was lower than the historic median (Figure 12) and mean harvest. Similarly, catch rate during the 1992-93 run year was outside and better than the interquartile range and 95% confidence interval of historic catch rates.

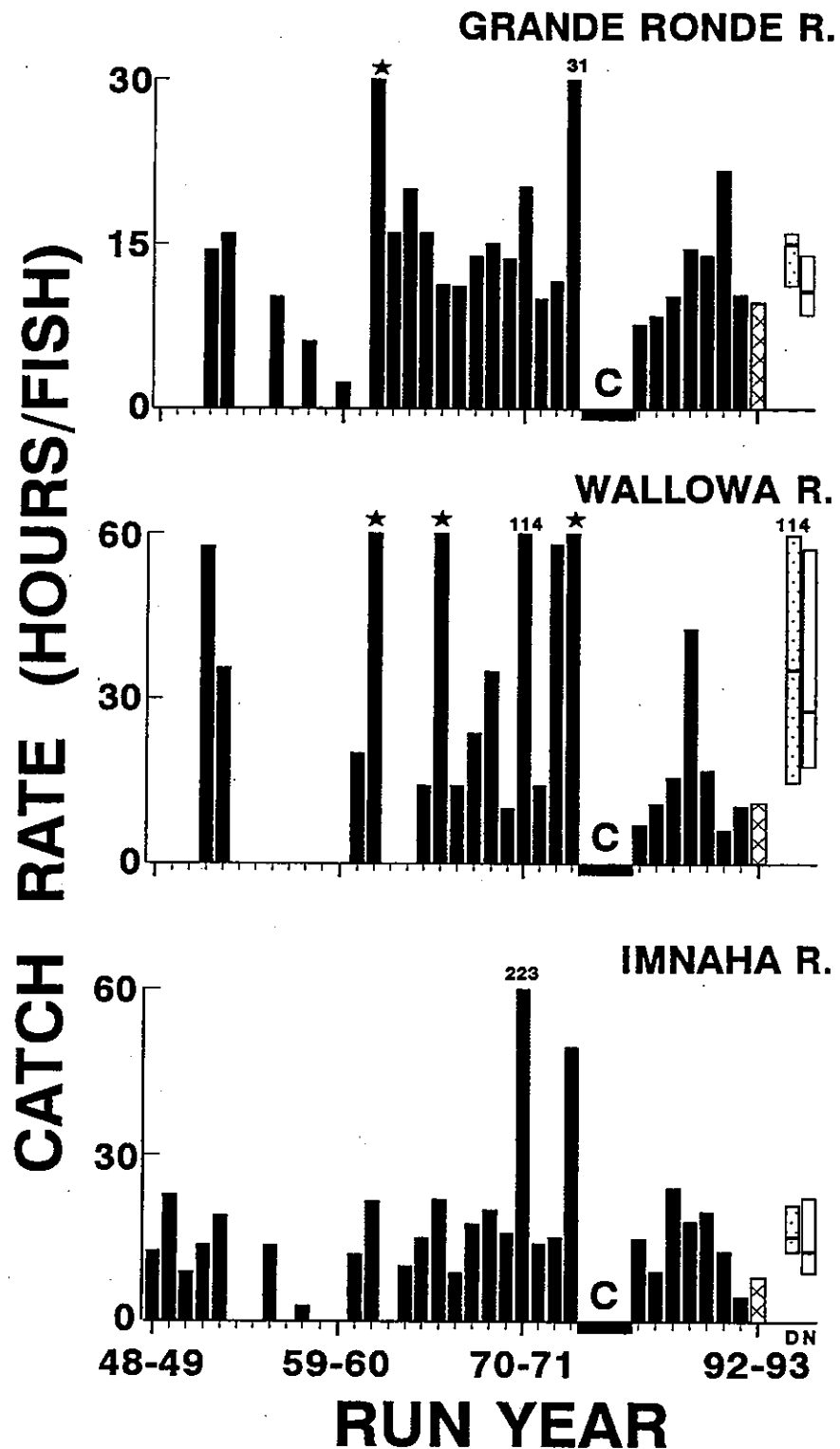


Figure 10. Historical (1949-74) and current (1986-93) catch rates from recreational fisheries on the Grande Ronde, Wallowa and Imnaha rivers. ★ = effort with no catch which results in an undefined catch rate; C = fishery closed; blank = data unavailable; D = median and interquartile range of historic values; and N = mean and 95% confidence interval of historic values. *Note: Low catch rate implies better angling success.*

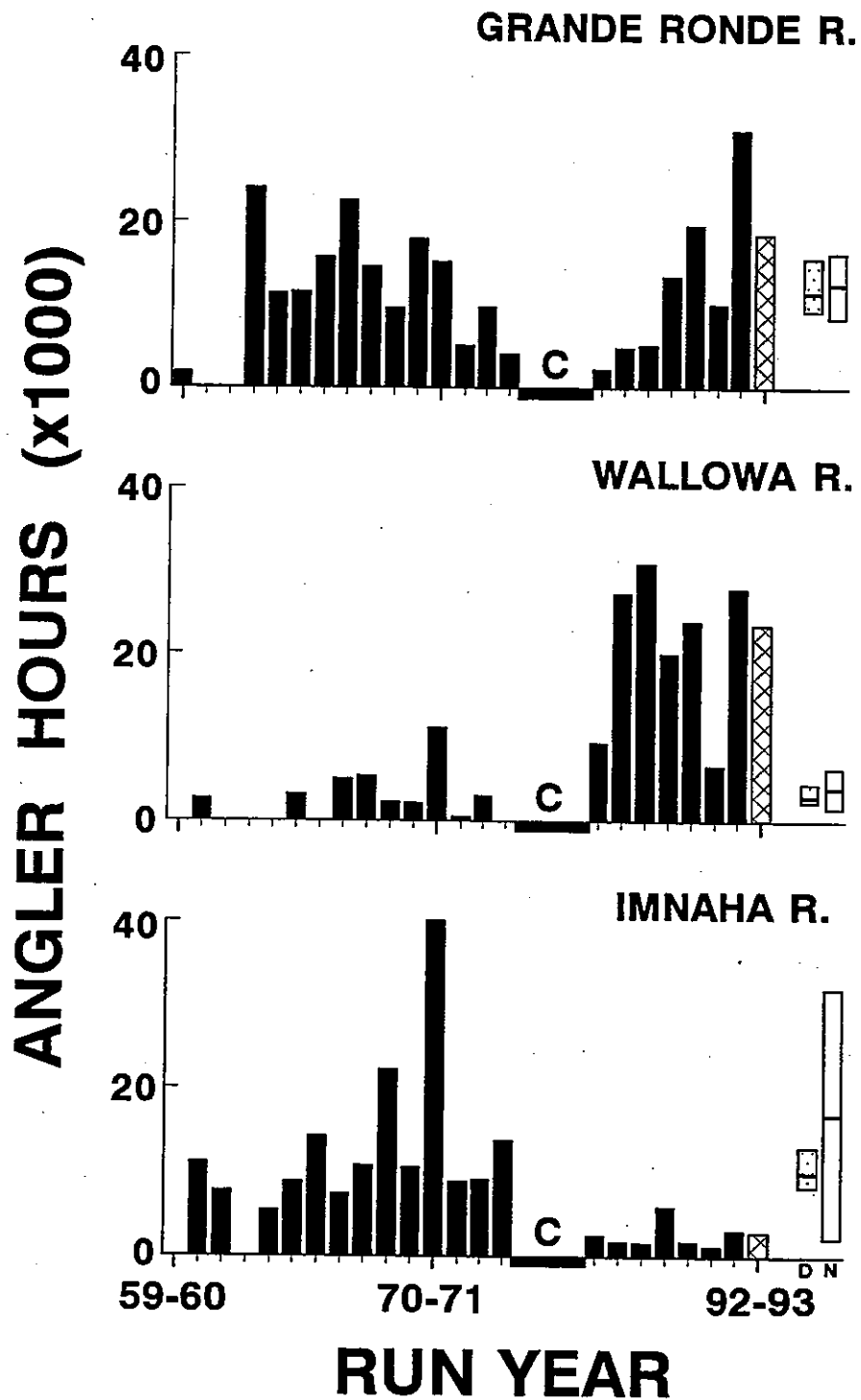


Figure 11. Historical (1960-74) and current (1986-93) angler effort from recreational fisheries on the Grande Ronde, Wallowa and Imnaha rivers. C = fishery closed; blank = data unavailable; D = median and interquartile range of historic values; and N = mean and 95% confidence interval of historic values.

However, angler effort was outside and below the interquartile range and within the 95% confidence interval of historic angler effort, and harvest was outside and below the interquartile range and 95% confidence interval of historic harvest. These data suggest that the Imnaha River fishery during the 1992-93 run year did not achieve the Lower Snake River Compensation Plan objective. However, catch rates in the 1992-93 Imnaha River fishery, which were better than all measures of historic levels, are encouraging and indicate that the potential exists to improve the fishery.

From the discussion above, there are several ways to compare the historic and current summer steelhead fisheries in the Grande Ronde and Imnaha basins. The measure used to describe the historic fishery can affect the interpretation of the comparison with a current fishery. We recommend using the historic median values rather than mean values because of the high variation between years in the historic data. It may also be appropriate to use the median because it is a more easily defined point estimate rather than a range of values such as the interquartile range or 95% confidence interval. A point estimate may be more simple to compare with a specific run year. However, given the high degree of interannual variability in all fisheries, it may be most reasonable to compare current fisheries to some range associated with historic values. The most appropriate measure of historic fisheries to use in comparisons with current fisheries should ultimately reflect the robustness of management objectives. Furthermore, a decision should be made on whether to evaluate Lower Snake River Compensation Plan objectives for northeast Oregon fisheries as a whole, or as river-specific fisheries.

Tribal fisheries on Wallowa and Imnaha summer steelhead stocks exist primarily in the Columbia River. Tribal harvest of these hatchery stocks occurs primarily in the Zone 6 (above Bonneville Dam) tribal gillnet fishery (Messmer et al., in preparation). Presently, except for an occasional tribal member angling with hook and line, there is no significant tribal fishery for steelhead in either the Grande Ronde or Imnaha river basins. Few, if any written records exist on historic tribal harvest in these systems other than in stories told by tribal elders (P. Lofy, Confederated Tribes of the Umatilla Indian Reservation and P. Kucera, Nez Perce Tribe, personal communication). This lack of written information makes it difficult to set appropriate goals for tribal fisheries. Adult returns of Wallowa and Imnaha hatchery stocks, however, are presently providing the opportunity for tribal fisheries to occur in both basins. Thus, options need to be developed for tribal summer steelhead fisheries in the Grande Ronde and Imnaha basins.

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Appendix A-1. Catch statistics for summer steelhead on the lower Grande Ronde River during the 1992-93 run year. Total catch and harvest includes $\pm 95\%$ confidence interval. Only adipose-marked fish were harvested.

Month, day type	<u>Sample size</u> days anglers		Total hours	Total catch	Total harvest	Catch rate (hour/fish)	Angler days
September:							
Weekday	6	28	399±158	34±24	10±19	11.7±8.3	149±59
Weekend	7	59	542±117	13±8	0	41.7±24.5	153±33
Total	13	87	941±197	47±25	10±19	20.0±10.7	302±63
October:							
Weekday	6	137	3178±939	338±107	105±61	9.4±3.0	544±161
Weekend	5	158	2258±564	290±149	98±71	7.8±4.0	357±89
Total	11	295	5436±1095	628±183	203±94	8.7±2.5	901±181
November:							
Weekday	6	67	1118±291	92±62	45±37	12.2±8.2	474±123
Weekend	4	61	1313±758	196±69	65±73	6.7±2.4	212±122
Total	10	128	2431±812	288±93	110±82	8.4±2.7	686±229
December:							
Weekday	6	10	267±239	44±148	14	6.1±17.7	56±50
Weekend	4	44	524±146	56±27	37±21	9.4±4.5	82±23
Total	10	54	791±280	100±150	51±21	7.9±10.2	138±49
February:							
Total	6	32	349±341	8±26	8	43.6±137.4	174±170
March:							
Weekday	8	52	1429±916	119±175	51±76	12.0±17.5	205±131
Weekend	4	105	4048±3453	494±198	111±66	8.2±3.3	552±471
Total	12	157	5477±3572	613±264	162±101	8.9±3.8	757±494
April:							
Total	5	1	36	0	0	--	5
Grand total	67	754	15461±3854	1684±369	544±163	9.2±2.0	2963±739

Appendix A-2. Catch statistics for summer steelhead on the upper Grande Ronde River during the 1992-93 run year. Total catch and harvest includes $\pm 95\%$ confidence interval. Only adipose-marked fish were harvested.

Month, day type	<u>Sample size</u> days anglers		Total hours	Total catch	Total harvest	Catch rate (hour/fish)	Angler days
February:							
Weekday	4	0	0	0	0	--	0
Weekend	2	2	14	0	0	--	7
Total	6	2	14	0	0	--	7
March:							
Weekday	7	14	130±194	14±18	14	9.3±11.5	148±221
Weekend	4	14	64±33	0	0	--	28±14
Total	11	28	194±197	14±18	14	13.9±17.2	176±179
April:							
Weekday	7	172	2182±731	180±57	147±60	12.1±3.8	1399±469
Weekend	4	64	640±373	29±27	16±21	22.1±20.4	305±178
Total	11	236	2822±820	209±63	163±64	13.5±4.1	1704±495
Grand total	28	266	3030±844	223±65	177±64	13.6±4.0	1887±526

Appendix A-3. Catch statistics for summer steelhead on Catherine Creek during the 1992-93 run year. Total catch and harvest includes $\pm 95\%$ confidence interval. Only adipose-marked fish were harvested.

Month, day type	<u>Sample size</u> days anglers		Total hours	Total catch	Total harvest	Catch rate (hour/fish)	Angler days
March:							
Weekday	3	2	47	0	0	--	16
Weekend	2	4	74	0	0	--	30
Total	5	6	121	0	0	--	46
April:							
Weekday	6	17	192±118	0	0	--	64±39
Weekend	4	35	172±45	10±10	10±10	17.2±17.4	83±22
Total	10	52	364±126	10±10	10±10	36.4±36.8	147±51
Grand total	15	58	485±126	10±10	10±10	48.5±49.0	193±50

Appendix A-4. Catch statistics for summer steelhead on the Wallowa River during the 1992-93 run year. Total catch and harvest includes $\pm 95\%$ confidence interval. Only adipose-marked fish were harvested.

Month, day type	<u>Sample size</u> days anglers		Total hours	Total catch	Total harvest	Catch rate (hour/fish)	Angler days
February:							
Weekday	6	20	364±162	0	0	--	160±71
Weekend	5	50	486±243	11±16	0	44.2±64.7	133±66
Total	11	70	850±292	11±16	0	77.3±112.9	293±101
March:							
Weekday	7	195	4792±2909	348±165	194±104	13.8±6.5	947±575
Weekend	4	155	2833±1183	203±111	112±95	14.0±7.7	656±274
Total	11	350	7625±3141	551±199	306±140	13.8±5.0	1603±660
April:							
Weekday	7	285	10035±3576	1045±240	562±172	9.6±2.2	1493±532
Weekend	4	207	4948±1329	513±102	215±88	9.6±1.9	746±200
Total	11	492	14983±3815	1558±261	777±193	9.6±1.6	2239±570
Grand total	33	912	23458±4950	2120±328	1083±238	11.1±1.7	4135±873

Appendix A-5. Catch statistics for summer steelhead on the Imnaha River during the 1992-93 run year. Total catch and harvest includes $\pm 95\%$ confidence interval. Only adipose-marked fish were harvested.

Month, day type	<u>Sample size</u> days anglers		Total hours	Total catch	Total harvest	Catch rate (hour/fish)	Angler days
March:							
Weekday	8	116	1216±669	126±72	49±32	9.7±4.5	334±184
Weekend	4	87	648±274	30±20	22±15	21.6±10.3	175±74
Total	12	203	1864±723	156±75	71±35	11.9±4.5	509±197
April:							
Weekday	4	64	576±135	102±14	66±27	5.6±0.6	176±41
Weekend	2	52	470±79	108±22	34±15	4.4±0.6	104±17
Total	6	116	1046±157	210±26	100±31	5.0±0.5	280±42
Grand total	18	319	2910±740	366±79	171±47	8.0±1.4	789±201

Appendix B. Percent of the summer steelhead caught that were hatchery fish in the Grande Ronde and Imnaha basins during the 1992-93 run year. Sample size is shown in parentheses.

Creel survey area	Sept	Oct	Nov	Dec	Feb	Mar	Apr
Lower Grande Ronde	34(47)	68(628)	72(288)	52(100)	100(8)	66(613)	--(0)
Upper Grande Ronde	--	--	--	--	--(0)	100(14)	89(209)
Catherine Creek	--	--	--	--	--	--(0)	100(10)
Wallowa	--	--	--	--	100(11)	88(551)	84(1558)
Imnaha	--	--	--	--	--	58(156)	69(210)



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